

LITERATURE CITED

- ANKEL, W.E. & EIGENBRODT, H. 1950. Über die Wuchsform von *Spongilla* in sehr flachen Räumen. Zoologischen Anzeiger 145: 195-204.
- AYLING, A.L. 1983. Growth and regeneration rates in thinly encrusting Demospongiae from temperate waters. Biological Bulletin 165: 343-352.
- BARTHEL, D. 1986. On the ecophysiology of the sponge *Halichondria panicea* in Kiel Bight. I. Substrate specificity, growth and reproduction. Marine Ecology Progress Series 32: 291-298.
- BARTHEL, D. & THEEDE, H. 1986. A new method for the culture of marine sponges and its application for experimental studies. Ophelia 25: 75-82.
- FOSSÅ, S.A. & NILSEN, A.J. 1996. Korallenriff-Aquarium, Band 5. Einzellige Organismen, Schwämme, marine Würmer und Weichtiere im Korallenriff und für das Korallenriff-Aquarium. (Birgit Schmettkamp Verlag: Bornheim).
- LANGENBRUCH, P.-F. 1983. Untersuchungen zum Körperbau von Meeresschwämmen. II. Das Wasserleitungssystem von *Halichondria panicea*. Helgoländer Meeresuntersuchungen 36: 337-346.
- LEE, Y.-K. & PIRT, S.J. 1981. Energetics of photosynthetic algal growth: influence of intermittent illumination in short (40 s) cycles. Journal of General Microbiology 124: 43-52.
- MUNRO, M.H.G., BLUNT, J.W., LAKE, R.J., LITAUDON, M., BATTERSHILL, C.N., PAGE, M.J. 1994. From seabed to sickbed: what are the prospects? Pp. 473-484. In Soest, R.W.M. van, Kempen, T.M.G. van & Braekman, J.C. (eds), Sponges in time and space. (Balkema: Rotterdam).
- OSINGA, R., TRAMPER, J. & WIJFFELS, R.H. 1998a. Cultivation of marine sponges for metabolite production: applications for biotechnology? Trends in Biotechnology 16:130-134.
- OSINGA, R., PLANAS MUELA, E., TRAMPER, J. & WIJFFELS, R.H. 1998b. *In vitro* cultivation of four marine sponge species. Determination of the nutritional demands. Pp. 121-127. In LeGal, Y. & Muller-Feuga, A. (eds) Marine microorganisms for industry. Actes des colloques 21. (IFREMER: Plouzané).
- POIRRIER, M.A., FRANCIS, J.C. & LABICHE, R.A. 1981. A continuous-flow system for growing fresh-water sponges in the laboratory. Hydrobiologia 79: 255-259.
- SANCHEZ-MORENO, H. 1984. Cultivo experimental de dos esponjas marinas en condiciones de laboratorio. Anales Instituto de Investigaciones Marinas Punta de Betin 14: 17-28.
- SIMPSON, T.L. 1963. The biology of the marine sponge *Microciona prolifera* (Ellis and Solander) I. A study of cellular function and differentiation. Journal of experimental Zoology 154: 135-152.
- THOMASSEN, S. & RIISGÅRD, H.U. 1995. Growth and energetics of the sponge *Halichondria panicea*. Marine Ecology Progress Series 128: 239-246.
- VETHAAK, A.D., CRONIE, R.J.A. & SOEST, R.W.M. VAN 1982. Ecology and distribution of two sympatric, closely related sponge species, *Halichondria panicea* (Pallas, 1766) and *H. bowerbanki* (Burton, 1930)(Porifera, Demospongiae), with remarks on their speciation. Bijdragen tot de Dierkunde 52: 82-102.

PREDATION ON CARIBBEAN SPONGES: THE IMPORTANCE OF CHEMICAL DEFENSES.

Memoirs of the Queensland Museum 44: 426. 1999.- The conventional view has been that the impact of predation on Caribbean reef sponges is minimal: generalist predatory fishes are deterred by sponge spicules and chemistry, while the few spongivorous fishes are 'smorgasbord' feeders that circumvent chemistry by eating small amounts of many different sponge species. New data suggest that this traditional view needs to be re-examined. Generalist predatory fishes are deterred by chemistry, but not by structural elements, toughness, or nutritional quality of sponge tissue. Spongivorous fishes are not smorgasbord

feeders, but instead choose to eat chemically undefended sponge species. Transplantation experiments reveal that the grazing activity of spongivorous fishes restricts certain sponge species to refugia, including cryptic habitats on the reef and mangrove and grassbed environments, where these fish are absent. Chemical defense plays an important role in the ecology of sponges on Caribbean reefs. □ *Porifera, chemical defense, predation, Caribbean, ecology.*

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